
CANCER FACTS

National Cancer Institute • National Institutes of Health

Questions and Answers About the Prostate-Specific Antigen (PSA) Test

1. What is the prostate-specific antigen (PSA) test?

The prostate-specific antigen (PSA) test measures the level of PSA in the blood. A blood sample is drawn and the amount of PSA is measured in a laboratory. PSA is a protein produced by the cells of the prostate gland. When the prostate gland enlarges, PSA levels in the blood tend to rise. PSA levels can rise due to cancer or benign (not cancerous) conditions. Because PSA is produced by the body and can be used to detect disease, it is sometimes called a biological marker or tumor marker.

As men age, both benign prostate conditions and prostate cancer become more frequent. The most common benign prostate conditions are prostatitis (inflammation of the prostate) and benign prostatic hyperplasia (BPH) (enlargement of the prostate). There is no evidence that prostatitis or BPH cause cancer, but it is possible for a man to have one or both of these conditions and to develop prostate cancer as well.

Although PSA levels alone do not give doctors enough information to distinguish between benign prostate conditions and cancer, the doctor will take the result of this test into account in deciding whether to check further for signs of prostate cancer.

2. Why is the PSA test performed?

The U.S. Food and Drug Administration (FDA) has approved the PSA test for use in conjunction with a digital rectal exam (DRE) to help detect prostate cancer in men age 50 and older. During a DRE, a doctor inserts a gloved finger into the rectum and feels the prostate gland through the rectal wall to check for bumps or abnormal areas. Doctors often use the PSA test and DRE as prostate cancer screening tests in men who have no symptoms of the disease.

The FDA has also approved the PSA test to monitor patients with a history of prostate cancer to see if the cancer has come back (recurred).

3. For whom might a PSA screening test be recommended? How often is testing done?

The benefits of screening for prostate cancer are still being studied. The National Cancer Institute (NCI) is currently conducting the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial, or PLCO trial, to determine if certain screening tests reduce the number of deaths from these cancers. The DRE and PSA are being studied to determine whether yearly screening to detect prostate cancer will decrease one's chance of dying from prostate cancer.

Doctors' recommendations for screening vary. Some encourage yearly screening for men over age 50; others recommend against routine screening; still others counsel men about the risks and benefits on an individual basis and encourage patients to make personal decisions about screening.

Several risk factors increase a man's chances of developing prostate cancer. These factors may be taken into consideration when a doctor recommends screening. Age is the most common risk factor, with more than 96 percent of prostate cancer cases occurring in men age 55 and older. Other risk factors for prostate cancer include family history and race. Men who have a father or brother with prostate cancer have a greater chance of developing prostate cancer. African American men have the highest rate of prostate cancer, while Native American men have the lowest.

4. How are PSA test results reported?

PSA test results report the level of PSA detected in the blood. The PSA level that is considered normal for an average man ranges from 0 to 4 nanograms per milliliter (ng/ml). A PSA level of 4 to 10 ng/ml is considered slightly elevated; levels between 10 and 20 ng/ml are considered moderately elevated; and anything above that is considered highly elevated. The higher a man's PSA level, the more likely it is that cancer is present. But because various factors can cause PSA levels to fluctuate, one abnormal PSA test does not necessarily indicate a need for other diagnostic tests. When PSA levels continue to rise over time, other tests may be indicated.

5. What if the test results show an elevated PSA level?

A man should discuss elevated PSA test results with his doctor. There are many possible reasons for an elevated PSA level, including prostate cancer, benign prostate enlargement, inflammation, infection, age, and race. If there are no other indicators that suggest cancer, the doctor may recommend repeating DRE and PSA tests regularly to monitor any changes.

If a man's PSA levels have been increasing or if a suspicious lump is detected in the DRE, the doctor may recommend other diagnostic tests to determine if there is cancer or another problem in the prostate. A urine test may be used to detect a urinary tract infection or blood in the urine. The doctor may recommend imaging tests, such as

ultrasound (a test in which high-frequency sound waves are used to obtain images of the kidneys and bladder), x-rays, or cystoscopy (a procedure in which a doctor looks into the urethra and bladder through a thin, lighted tube). Medicine or surgery may be recommended if the problem is BPH or an infection.

If cancer is suspected, the only way to tell for sure is to perform a biopsy. For a biopsy, samples of prostate tissue are removed and viewed under a microscope to determine if cancer cells are present. The doctor may use ultrasound to view the prostate during the biopsy, but ultrasound cannot be used alone to tell if cancer is present.

6. What are some of the limitations of the PSA test?

- **Detection does not always mean saving lives:** Even though the PSA test can detect small tumors, finding a small tumor does not necessarily reduce a man's chance of dying from prostate cancer. PSA testing may identify very slow-growing tumors that are unlikely to threaten a man's life. Also, PSA testing may not help a man with a fast-growing or aggressive cancer that has already spread to other parts of his body before being detected.
- **False positive tests:** False positive test results (also called false positives) occur when the PSA level is elevated, but no cancer is actually present. False positives may lead to additional medical procedures, with significant financial costs and anxiety for the patient and his family. Most men with an elevated PSA test turn out *not* to have cancer.

False positives occur primarily in men age 50 or older. In this age group, 15 of every 100 men will have elevated PSA levels (higher than 4 ng/ml). Of these 15 men, 12 will be false positives and only three will turn out to have cancer.

- **False negative tests:** False negative test results (also called false negatives) occur when the PSA level is in the normal range even though prostate cancer is actually present. Most prostate cancers are slow-growing and may exist for decades before they are large enough to cause symptoms. Subsequent PSA tests may indicate a problem before the disease progresses significantly.

7. Why is the PSA test controversial?

Using the PSA test to screen men for prostate cancer is controversial because it is not yet known if the process actually saves lives. Moreover, it is not clear if the benefits of PSA screening outweigh the risks of followup diagnostic tests and cancer treatments.

The procedures used to diagnose prostate cancer may cause significant side effects, including bleeding and infection. Prostate cancer treatment often causes incontinence and impotence. For these reasons, it is important that the benefits and risks of diagnostic

procedures and treatment be taken into account when considering whether to undertake prostate cancer screening.

8. What research is being done to improve the PSA test?

Scientists are researching ways to distinguish between cancerous and benign conditions, and between slow-growing cancers and fast-growing, potentially lethal cancers. Some of the methods being studied are:

- **PSA velocity:** PSA velocity is based on changes in PSA levels over time. A sharp rise in the PSA level raises the suspicion of cancer.
- **Age-adjusted PSA:** Age is an important factor in increasing PSA levels. For this reason, some doctors use age-adjusted PSA levels to determine when diagnostic tests are needed. When age-adjusted PSA levels are used, a different PSA level is defined as normal for each 10-year age group. Doctors who use this method suggest that men younger than age 50 should have a PSA level below 2.5 ng/ml, while a PSA level up to 6.5 ng/ml would be considered normal for men in their 70s. Doctors do not agree about the accuracy and usefulness of age-adjusted PSA levels.
- **PSA density:** PSA density considers the relationship of the PSA level to the size and weight of the prostate. In other words, an elevated PSA might not arouse suspicion in a man with a very enlarged prostate. The use of PSA density to interpret PSA results is controversial because cancer might be overlooked in a man with an enlarged prostate.
- **Free versus attached PSA:** PSA circulates in the blood in two forms: free or attached to a protein molecule. With benign prostate conditions, there is more free PSA, while cancer produces more of the attached form. Researchers are exploring different ways to measure PSA and to compare these measurements to determine if cancer is present.
- **Other screening tests:** Scientists are also developing screening tests for other biological markers, which are not yet commercially available. These markers may be present in higher levels in the blood of men with prostate cancer.

For additional information about prostate cancer, contact the Cancer Information Service (see below).

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Sources of National Cancer Institute Information

Cancer Information Service

Toll-free: 1-800-4-CANCER (1-800-422-6237)

TTY (for deaf and hard of hearing callers): 1-800-332-8615

NCI Online

Internet

Use <http://cancer.gov> to reach NCI's Web site.

CancerMail Service

To obtain a contents list, send e-mail to cancermail@icicc.nci.nih.gov with the word "help" in the body of the message.

CancerFax® fax on demand service

Dial 301-402-5874 and listen to recorded instructions.

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